



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : C07C 51/31, 55/14	A1	(11) International Publication Number: WO 00/01656 (43) International Publication Date: 13 January 2000 (13.01.00)															
(21) International Application Number: PCT/US99/15134 (22) International Filing Date: 2 July 1999 (02.07.99) (30) Priority Data: <table border="0"> <tr> <td>60/091,483</td> <td>2 July 1998 (02.07.98)</td> <td>US</td> </tr> <tr> <td>60/093,256</td> <td>17 July 1998 (17.07.98)</td> <td>US</td> </tr> <tr> <td>60/105,048</td> <td>20 October 1998 (20.10.98)</td> <td>US</td> </tr> <tr> <td>60/110,206</td> <td>30 November 1998 (30.11.98)</td> <td>US</td> </tr> <tr> <td>60/111,848</td> <td>11 December 1998 (11.12.98)</td> <td>US</td> </tr> </table> (71) Applicant: RPC INC. [US/US]; 2170 Piedmont Road, Atlanta, GA 30324 (US). (72) Inventors: DeCOSTER, David, C.; 5509 - 234th Avenue East, Buckley, WA 98321 (US). VASSILIOU, Eustathios; 12 South Townview Lane, Newark, DE 19711-7419 (US). DASSEL, Mark, W.; P.O. Box 486, Indianola, WA 98342 (US). ROSTAMI, Ader, M.; 9205 Northeast Sea Ray Court, Bainbridge Island, WA 98110 (US). DUDGEON, Douglas, J.; 280 Wyatt Way Northeast, No. B-206, Bainbridge Island, WA 98110 (US). (74) Agents: PARKER, David, W. et al.; Seed and Berry LLP, 6300 Columbia Center, 701 Fifth Avenue, Seattle, WA 98104-7092 (US).		60/091,483	2 July 1998 (02.07.98)	US	60/093,256	17 July 1998 (17.07.98)	US	60/105,048	20 October 1998 (20.10.98)	US	60/110,206	30 November 1998 (30.11.98)	US	60/111,848	11 December 1998 (11.12.98)	US	(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
60/091,483	2 July 1998 (02.07.98)	US															
60/093,256	17 July 1998 (17.07.98)	US															
60/105,048	20 October 1998 (20.10.98)	US															
60/110,206	30 November 1998 (30.11.98)	US															
60/111,848	11 December 1998 (11.12.98)	US															
(54) Title: METHODS OF EXTRACTING CATALYST FROM A REACTION MIXTURE IN THE OXIDATION OF CYCLOHEXANE TO ADIPIC ACID (57) Abstract This invention relates to methods of controlling the oxidation of cyclohexane to adipic acid in the presence of a monobasic acid solvent, by extracting the catalyst from the reaction mixture, outside the reaction zone. Substantially all the unreacted cyclohexane, the majority of adipic acid, and preferably substantially all the monobasic acid solvent are removed from the reaction product. In the case that substantially all the monobasic acid solvent is removed, protic solvent, is added intermittently or continuously in the reaction mixture during the removal of the monobasic acid solvent, preferably by distillation, thus preventing solids precipitation. Dipolar aprotic solvent is then added in the presence of an adequate amount of the protic solvent (the total of dipolar aprotic solvent and the protic solvent constituting a novel combination solvent) to maintain a single liquid phase, followed by a step of extracting substantially all the catalyst in protic solvent. The catalyst extract is preferably recycled to the reaction zone, where the cyclohexane is oxidized to adipic acid. Thus, the novel combination solvent, which is preferably a combination of cyclohexanone with water, allows the dissolution of the reaction product, preferably after removal of the majority of the adipic acid, followed by a substantially complete extraction of the catalyst in water. No catalyst precipitation takes place, and all disadvantages and costs of solids handling are prevented.																	